**UNITED STATES DEPARTMENT OF COMMERCE**
**The Assistant Secretary for Communications and Information**
Washington, D.C. 20230

April 15, 1996



The Honorable Reed Hundt
Chairman
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: Third Notice of Proposed Rulemaking
PP Docket No. 93-253



Dear Chairman Hundt:

Today, the National Telecommunications and Information Administration (NTIA) within the Department of Commerce is filing comments in the above-referenced proceeding supporting combinatorial auctions to assign certain radio spectrum licenses in the 220-222 MHz band. NTIA has long supported spectrum auctions as an efficient and fair means to assign licenses for new telecommunications services, such as personal communications service and other mobile services, while raising revenue for the U.S. Treasury.

With this letter, NTIA is also announcing its intent to remove the primary allocations to the Federal Government on certain channels in this band. This intended action is based primarily on the Commission's tentative conclusion in the above-referenced proceeding that it would use competitive bidding to license 125 non-nationwide channels in the 220-222 MHz band, including channels 01-20, 31-50, 61-80, 91-110, 121-140, 171-180, and 186-200. Thus, concurrent with the Commission's adoption of final and effective rules that require the Commission to license these 125 non-nationwide channels pursuant to competitive bidding, the Federal Government will relinquish its co-primary status with respect to the above-listed channels. At that time, such spectrum, which is currently allocated on a co-primary basis to both Federal and non-Federal users, will be available to non-Federal users for their primary use.

I am pleased to inform the Commission of NTIA's intended action that will foster the fair and efficient licensing of frequencies in the 220-222 MHz band. By agreeing to remove the Federal Government's co-primary status with respect to these channels, NTIA seeks to increase potentially this spectrum's value at auction

and to promote the availability of this radio spectrum for commercial mobile services. By working together, NTIA and the Commission are making it possible for the American public to benefit from the provision of new and innovative commercial mobile services over these channels. As requested by the Commission in its rulemaking notice, NTIA will continue to coordinate with the Commission on this matter. I look forward to the engagement of our joint efforts for the benefit of the American public.

Sincerely,

Larry Irving

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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| In the Matter of | ) | |
| | ) | |
| Implementation of | ) | |
| Section 309(j) of the | ) | PP Docket No. 93-253 |
| Communications Act -- | ) | |
| Competitive Bidding, | ) | |
| 220-222 MHz | ) | |

# REPLY COMMENTS OF THE NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION


Larry Irving
Assistant Secretary for
Communications and Information

Barbara S. Wellbery
Chief Counsel

Bernadette McGuire-Rivera
Acting Deputy Assistant Secretary
for Communications and Information

Phyllis Hartsock
Deputy Chief Counsel

Kathryn Brown
Associate Administrator
Office of Policy Analysis
and Developement

Timothy R. Robinson
Jordan Goldstein
Office of Chief Counsel

Mark M. Bykowsky
Robert Cull
Office of Policy Analysis
and Development

National Telecommunications
and Information Administration

U.S. Department of Commerce
Room 4713
14th and Constitution Ave., N.W.
Washington, D.C. 20230
(202)482-1816


April 15, 1996

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REPLY COMMENTS
OF THE
NATIONAL TELECOMMUNICATIONS
AND INFORMATION ADMINISTRATION

The National Telecommunications and Information Administration (NTIA) respectfully requests that the Commission consider these reply comments in response to the Commission's Third Notice of Proposed Rulemaking (*Third Notice*) in the above-captioned proceeding.[1/] NTIA is the agency within the Department of Commerce principally responsible for the development and presentation of domestic and international telecommunications and information policy on behalf of the President and for management of Federal use of the radio frequency spectrum.

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1/ Implementation of Section 309(j) of the Commmunications Act, Third Notice of Proposed Rulemaking, 11 FCC Rcd. 188 (1995) (hereinafter *Third Notice*).

## I. INTRODUCTION AND SUMMARY

The *Third Notice* requests comment on the most appropriate auction design for assigning 220-222 MHz, non-nationwide licenses.[2/] In that Notice, the Commission proposed to group together Economic Area licenses in the 220 MHz band that exhibit "value interdependencies" and to auction simultaneously each of the individual licenses within each group.[3/] NTIA's reply comments specifically address the assignment of 220 MHz Economic Area licenses pursuant to this proposed auction scheme.

In addition, as the spectrum manager for the Federal Government, NTIA has determined that the Federal Government has limited demand for spectrum for 220 MHz, non-nationwide licenses, which has been allocated for shared use between the Federal Government and non-Federal users on a co-equal basis. By separate letter to the Commission, the Administrator of NTIA is announcing that NTIA intends to remove the primary allocation to the Federal Government on 125 channels in this band that have

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[2/] The Commission proposed to auction licenses (i.e., Phase II licenses) using available 220 MHz channels on a national and non-nationwide basis. Of the non-nationwide licenses, the Commission proposed to assign available channels in 172 geographic areas defined as Economic Areas by the Bureau of Economic Analysis, Department of Commerce (Economic Area licenses), and in larger areas defined by five 220 MHz Regions (Regional licenses). See id. at 198-200.

[3/] See id. at 245.

been proposed for non-nationwide licensing.[4/] This action is consistent with NTIA's policies supporting spectrum efficiency and the use of spectrum auctions to increase assignment efficiency and generate revenue for the U.S. Treasury.

With respect to radio spectrum auctions, NTIA commends the Commission for designing custom-tailored auction rules to suit different types of commercial radio services and different bidding environments. The characteristics of a particular radio service and the bidding environment surrounding the licensing of that service must, therefore, be examined to ensure that the proposed auction design promotes Congress's objectives with respect to competitive bidding.

Because the Commission has classified 220 MHz service as a commercial mobile radio service, it clearly anticipates this service will compete with other commercial radio services. Notwithstanding this expectation, the Commission has proposed to allocate relatively less spectrum to Economic Area licensees than it has to other CMRS licensees. In addition, Economic Area licensees will more than likely be authorized to operate within significantly smaller service areas than are required of other

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[4/] See Letter to Chairman Reed E. Hundt, Federal Communications Commission from Larry Irving, Assistant Secretary of Communications and Information, U.S. Department of Commerce and Administrator of the National Telecommunications and Information Administration in PP Docket No. 93-253, filed 4/15/96 (filed with the FCC in conjunction with these comments).

commercial radio licensees. Therefore, bidders for Economic Area licenses will probably find it necessary to aggregate spectrum blocks and to consolidate licenses representing adjacent geographic license areas in order to compete effectively with other CMRS providers.

Accordingly, as discussed in more detail in Section II.B below, these proposed licenses are substantially more "value interdependent" than licenses for comparable wireless services. Such interdependencies between Economic Area licenses make them particularly suited for simultaneous combinatorial bidding -- an auction form that NTIA previously recommended to the FCC with respect to broadband PCS.[5/] NTIA believes that combinatorial auctions will result in bids that reflect more accurately bidders' valuations for these types of licenses.

Although the Commission has previously acknowledged the benefits of combinatorial auctions, it has not adopted that approach -- anticipating that such auctions may raise, among other things, "administrative and operational" issues.[6/]

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[5/] See *Ex Parte* Letter to Chairman Reed E. Hundt, Federal Communications Commission from Larry Irving, Assistant Secretary of Communications and Information, U.S. Department of Commerce and Administrator of the National Telecommunications and Information Administration in PP Docket No. 93-253, filed 2/28/94 (reporting results of CalTech experiments supporting NTIA's proposal for combinatorial auctions); see also Comments of NTIA in PP Docket No. 93-253 (filed 11/10/93)(supporting use of combinatorial auctions for assignment of broadband PCS licenses).

[6/] *Third Notice* at 244-45.

Instead, the Commission has chosen to adopt simultaneous, multiple round bidding in auctions for personal communications services (PCS) and other commercial mobile radio services (CMRS).

In a combinatorial auction, bidders can bid for a package of licenses without fear of amassing only a part of that package.[7/] As a result, their bids are prone to reflect accurately the value that they place on the license package. In a non-combinatorial auction, bidders must reflect their valuation for a package of licenses through individual bids on component licenses. If a bidder in a non-combinatorial auction values a package of licenses more highly than the sum of its component parts, then that bidder risks bidding above the "a la carte" value of each individual license, amassing a partial package of its desired licenses, and possibly overbidding given the value of the partial package. Because bidders obtain "all-or-nothing" packages in a combinatorial auction, these risks are eliminated. The likely result is more intense bidding competition, increased revenues

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7/ Simultaneous, multiple round bidding refers to an auction in which bidders are able to place bids on single items throughout the course of the auction and can top the high bids from a previous round. A multiple round, combinatorial auction, in contrast, allows all of the above, but also permits bidders to place bids on a combination of items in addition to individual items.

for the U.S. Treasury, and, in many cases, a more efficient assignment of licenses.[8/]

For these reasons, NTIA urges the Commission to reconsider whether combinatorial auctions are "administratively and operationally" feasible, and if so, to implement combinatorial auctions for assigning Economic Area licenses. In the event that the Commission decides not to adopt combinatorial auctions, however, NTIA proposes some modifications to the Commission's existing Stage III eligibility rules. Specifically, the proposed modifications would reduce the existing 100 percent eligibility requirement in Stage III to a lesser amount -- for example 90 percent. As discussed in more detail in Section III.B below, such a reduction could give bidders greater flexibility and better information in determining which licenses to pursue, especially near the end of the auction.

## II. COMBINATORIAL AUCTIONS WILL ELIMINATE FINANCIAL EXPOSURE RISKS TO BIDDERS

### A. Background

After considering the attributes of 220 MHz service, the Commission concluded that 220 MHz service could be used to

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[8/] If, however, bidders bid aggressively despite the threat of financial exposure a non-combinatorial auction may yield substantial revenue. See Mark M. Bykowsky, Robert J. Cull, and John O. Ledyard, Mutually Destructive Bidding: The FCC Auction Design Problem 17 (January 1995) (on file with NTIA and the California Institute of Technology) (hereinafter Mutually Destructive Bidding).

provide commercial, interconnected service to a substantial portion of the public.[9/] Thus, the Commission reclassified 220 MHz service (to the extent that it could be used as a "for-profit" service) from a private land mobile radio service to a commercial mobile radio service (CMRS) and concluded that it possessed competitive bidding authority with respect to the licensing of mutually exclusive, initial 220 MHz applications.

### B. Important Differences Between 220 MHz Licenses and Other CMRS Licenses Particularly Warrant the Use of Combinatorial Auctions

By permitting bids to be entered on packages of licenses as well as individual licenses, combinatorial auctions minimize "financial exposure" risks to which bidders would be subject had they been able to aggregate licenses only by bidding on a number of individual licenses. In addition, combinatorial auctions, which permit individual licenses to be auctioned together as packages, are most useful where, as here, bidders value individual auction items, place higher values on packages of such items, and their intended uses for such synergistic licenses partially overlap. In such instances, where combinatorial bidding is not used, bidders are more likely to adjust their bidding activity and strategy in response to factors that are unrelated to the items' economic values. Thus, an auction design that does not allow for combinatorial bidding in such an instance

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[9/] See Implementation of Sections 3(n) and 332 of the Communications Act, 9 FCC Rcd. 1411, 1451-1452 (1994).

is more likely to reduce the high level of assignment efficiency that economists generally associate with competitive bidding.

A bidder is more likely to select an appropriate bidding strategy in a combinatorial auction for communications licenses than a non-combinatorial auction when two factors are present. The first factor is the extent to which a bidder must acquire complementary or substitutable licenses in order to enjoy economies of scale and scope. Such economies can enable a licensee to provide multiple competitive services to a larger area of customers or to become better technically able to provide those services. The second factor is the degree to which the Commission's allocation rules authorize spectrum use for a variety of uses and, therefore, increase the likelihood of a partial overlap among bidders' intended uses for that spectrum.

Both factors appear to be present here. For example, most commenters in the instant proceeding corroborated the Commission's tentative findings that (1) the proposed allocations for 220 MHz service consist of significantly less bandwidth than the amount allocated to competing services (e.g., cellular, specialized mobile radio, and PCS services); and (2) as a result, bidders need flexibility to "aggregate and substitute across spectrum blocks and geographic regions."[10/] Most commenters

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[10/] *Third Notice* at 243; see Comments of US MobilComm, Inc., at 5 ("Limits on aggregation restrict the commercial viability of the spectrum and prevent 220 MHz license holders from competing

also supported generally the Commission's proposal to revise its operational rules and permit flexible uses of 220 MHz spectrum.[11/] Accordingly, the flexible uses of Economic Area licenses (e.g., commercial, paging, non-commercial, fixed services) and their various possible channelizations and wide-area service configurations argue for a combinatorial auction design.[12/]

The Commission's proposed technical and operational rules for Economic Area licenses take into account these two factors, unlike its proposed auction rules. As a result, bidders, who are unable to offer bids for licenses that accurately reflect their revenue and profit-generating possibilities, may be financially exposed. For these reasons, the Commission should modify its proposed auction design to allow combinatorial bidding in order to increase the economic efficiency of auctions for Economic Area licenses.

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with other CMRS providers."); Comments of Paging Network, Inc., at 11-12 (Commission should not preclude 220 MHz from providing a variety of services by prohibiting channel aggregation).

11/ See Comments of PageMart Operations, Inc., at 3-4. Under this proposal, 220 MHz licensees would be free to choose between providing commercial, non-commercial, or a combination of these services as well as to provide fixed and paging services on a primary basis.

12/ The Commission plans to group together those licenses that it deems to be value interdependent. Since bidders are in a better position to assess value interdependencies among licenses, NTIA believes that bidders should be free to arrange their own combinations. The extent of this freedom, of course, would be subject to the administrative capacities of the auction. See infra note 13.

Although the Commission has recognized that combinatorial bidding on licenses with high value interdependencies could produce desirable outcomes, the Commission proposes in this proceeding to select a non-combinatorial auction over combinatorial bidding due to the "administrative and operational complexity" that it believes will result from combinatorial bidding.[13/] Additionally, the Commission projects that combinatorial bidding could bias auction outcomes in favor of large combination bids.[14/]

As a frequent commenter supporting combinatorial auctions, NTIA is familiar with the issues that the Commission raises. Indeed, NTIA has worked actively to resolve these issues so that combinatorial auctions could be implemented by the Commission. Since the Commission first announced these potential complications almost two years ago, NTIA has learned of the

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[13/] See *Third Notice* at 244-45. The Commission has previously noted that combinatorial bidding could possibly produce a very large number of license combinations if bids could be accepted on any combination of licenses. This apparently concerned the Commission since it also noted at that time that computer software had not been "fully developed for use on [such] a large scale [posing a risk of] computer or other administrative failure." Implementation of Section 309(j) of the Communications Act, 9 FCC Rcd. 2348, 2365-66 (1994)(*PCS Second Report and Order*).

[14/] See *Third Notice* at 244-45.

introduction of computer software that may eliminate these concerns.[15/]

With respect to the Commission's position that combinatorial bidding could bias auction outcomes in favor of bidders on large combinations of licenses, NTIA believes that in actuality the converse would occur in the absence of combinatorial bidding.[16/] Specifically, NTIA believes that unless the Commission adopts combinatorial bidding it is probable that auction outcomes could

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[15/] An electronic market for trading pollution credits in Southern California has been operating for approximately one year using an auction system that allows combinatorial bidding. This multi-round auction allows companies to bid either on a single type of credit or on a package of credits spread out over time, which is analogous to the combinatorial auction that NTIA is recommending. Indeed, the pollution credit auction has several features that are even more complex. For example, companies may submit "or" bids, in which the company bids on two packages of credits in order to win either one of the packages, but not both. Companies may also indicate that they are willing to accept a particular percentage of their package if the entire order cannot be filled. See World Wide Web Computer Home Page of Automated Credit Exchange, http://www.ace-mkt.com/.

[16/] The Commission concluded in its *PCS Second Report and Order* that combinatorial bidding makes it likely that bidders for individual licenses or smaller packages would be "reluctant to raise their own bids in order to beat a combinatorial bid for a larger package" in anticipation that other small bidders on other parts of the larger package would raise their bids. See *PCS Second Report and Order* at 2365-66.

be biased in favor of small combination bidders.[17/] Nevertheless, NTIA still firmly believes that the use of a stand-by queue mechanism, which would permit smaller bidders to coordinate their bids to compete against the current prevailing bids for a large package of individual licenses, is capable of resolving the potential bias issue raised by the Commission in connection with combinatorial auctions.[18/]

Thus, in the interest of establishing an auction design that promotes a more efficient assignment of value interdependent licenses, NTIA urges the Commission to review the capabilities of available software and determine whether such software can now sufficiently handle these anticipated problems. In the event that suitable software exists, NTIA suggests that the Commission adopt simultaneous, multiple round combinatorial auctions.

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[17/] See Mutually Destructive Bidding at 27 (summarizing experimental findings showing that non-combinatorial bidding produces biases favoring bidders on individual licenses and small license packages).

[18/] NTIA proposed the implementation of a stand-by queue to address the "free rider" issue in the *PCS Second Report and Order* proceeding. The Commission responded negatively to this proposal. In particular, the Commission stated that a large bidder could "strategically flood the [stand-by] queue with numerous contingent bids in order to prevent it from functioning." See *PCS Second Report and Order* at 2366 n.93. NTIA submits that even if the Commission could show that combinatorial bidding would favor large bidders, the use of a stand-by queue in addition to limiting the number of bids on a particular license that one bidder could make would sufficiently mitigate this potential bias.

## III. ALTERNATIVELY, THE COMMISSION SHOULD MODIFY ITS STAGE III ELIGIBILITY RULES TO PROVIDE MORE FLEXIBILITY FOR BIDDERS

If the Commission decides not to adopt combinatorial bidding, NTIA proposes that the Commission reduce the Stage III eligibility requirement slightly, for example, from 100 percent to 90 percent.[19/] NTIA believes that such a reduction may result in greater economic efficiency as licenses will more likely be sold to bidders valuing them most.

### A. Auction Effectiveness and the NTIA Study

NTIA conducted an empirical study of the broadband PCS auctions (A and B block licenses) and used regression analysis to study that data.[20/] The NTIA Study suggests that the broadband auction's Stage III eligibility rules may have limited the ability of bidders to switch their activity from small to large markets. Therefore, the NTIA Study concludes it is likely that these bidders were unable to bid actively on licenses for larger markets in the later auction rounds. It posits as a result that the sales prices for small market licenses may have been higher

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19/ The Commission's eligibility rules, also known as activity rules, were designed to help ensure that bidders in simultaneous, multiple round auctions did not wait until the end of the auction before actively participating. During Stage I, a bidder would have to bid actively on one-third of the total number of its eligible POPs (i.e., population within the bid-upon license area). In Stage II, a bidder is required to remain active on two-thirds of its total number of POPs. In Stage III, a bidder is required to remain active on 100 percent of its total number of eligible POPs.

20/ See Mark M. Bykowsky and Robert J.Cull, Broadband PCS (MTA) Auction: An Empirical Examination (hereinafter NTIA Study)

than those for larger market licenses, after controlling for other relevant factors that affect prices. The NTIA Study further concludes, as explained below, that a small reduction in the Stage III eligibility requirement, for example from 100 percent to approximately 90 percent might avoid these potential effects in future auctions.

B. The Evidence Supporting NTIA's Hypothesis

On average, NTIA found that bidding activity on licenses for smaller to moderately populated markets extended further into later rounds than bidding on licenses in more largely populated markets.[21/] After observing this bidding activity, NTIA used regression analysis to explain variations in the final sales prices of broadband PCS licenses.

In connection with this analysis, NTIA used the final auction price of the MTA licenses as the dependent variable. In addition, NTIA defined as their independent variables certain factors that could affect the probable final sales price of a MTA license, including (a) MTA population; (b) per capita income; (c) the percentage change in MTA population from 1990-1994; and (d) MTA population per square mile (i.e., population density). Additional variables were introduced into the regression in an attempt to measure the effects that the Commission's bidder

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21/ See NTIA Study at 16 (comparing auction round closings for various licenses according to their Metropolitan Trading Area (MTA) rank).

eligibility rules may have had on those licenses that closed in later rounds.[22/] NTIA's analysis shows that licenses that closed later were sold at relatively higher prices. This supports NTIA's preliminary hypothesis that the Stage III bidding eligibility rules had the unforeseen effect of complicating bidders' abilities to switch their attention between licenses near the end of the auction.

A bidder's inability to predict the eventual sales price(s) of its preferred set(s) of licenses and to pursue those licenses could have been exacerbated by the Stage III eligibility requirement. Within the Commission's three-stage auction format for broadband PCS, bidders utilized numerous bidding strategies. In the third stage, however, bidders probably focused on a strategy to pursue those sets of licenses that would maximize their net profits. Accordingly, bidders most likely switched their bidding attention to those license(s) that would most likely yield the greatest net profits.[23/]

The Stage III eligibility requirement, however, may have caused some bidders to switch their bidding attention to licenses for less populated markets, even though such licenses appear to have generated lower profits than licenses for larger populated areas. NTIA believes that a reduction in the Commission's Stage

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[22/] See id. at 19.

[23/] See id. at 14.

III eligibility requirements, for example from 100 percent to 90 percent, could potentially preserve the ability of more bidders to continue bidding on, or switch their attention to, licenses for larger populated areas in the later rounds of the auction.

One possible effect of such a reduction is that auctions for Economic Area licenses may be prolonged slightly due to increased bidding activity on larger market licenses. Lengthening the auctions, however, translates into only a nominal expense after this expense is compared to the resulting economic efficiencies that could accrue to the Commission in connection with its assignment of Economic Area licenses through competitive bidding. Bidders would also benefit since the recommended reduction in the eligibility requirements would assist them in implementing an appropriate bidding strategy to pursue those licenses they value most.

## IV. CONCLUSION

As NTIA has shown, the Commission could benefit bidders and also ensure that licenses are assigned to those parties that value them most by introducing a combinatorial design into the 220-222 MHz auctions. Based on NTIA's supportable hypothesis, it is quite possible that the Commission's proposed auction design (i.e., simultaneous, multiple round bidding), absent further modification, may affect bidders' abilities to pursue aggressively those license(s) they desire most. For the

foregoing reasons, NTIA respectfully requests that the Commission adopt the recommendations contained herein to promote greater economic efficiency in the assignment of Economic Area licenses.

Respectfully submitted,

Larry Irving
Assistant Secretary for
Communications and Information

Barbara S. Wellbery
Chief Counsel

Bernadette McGuire-Rivera
Acting Assistant Secretary for
Communications and Information

Timothy R. Robinson
Attorney-Advisor

Kathryn Brown
Associate Administrator
Mark Bykowsky
Robert Cull
Tim Sloan
Office of Policy Analysis
and Development

National Telecommunications
and Information Administration
U.S. Department of Commerce
Room 4713
14th and Constitution Ave., N.W.
Washington, D.C. 20230
(202)482-1816

April 15, 1996

# Broadband PCS (MTA) Auction: An Empirical Examination

Office of Policy Analysis and Development

Staff Paper

by

Mark M. Bykowsky and Robert J. Cull

National Telecommunications and Information Administration

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The views expresssed are the authors' and do not necessarily reflect those of NTIA. The authors would like to thank Ralph Alvarez, Steve Harvey for research assistance and Timothy Robinson, Tim Sloan, and Jordan Goldstein for helpful comments on an earlier draft.

## I. Introduction and Background

The Federal Communications Commission ("FCC") has conducted four auctions to assign radio spectrum licenses. The first auction involved the sale of spectrum used to provide interactive video services. In the second and third auctions, the FCC assigned licences used to offer wireless paging services. More recently, the FCC auctioned licenses to provide broadband Personal Communications Services ("PCS"), a wireless communications service capable of providing voice, data, and facsimile service via lightweight multi-function portable phones.[1]

The broadband PCS auction, in particular, attracted a considerable amount of attention from policy makers and the press. Not only will broadband PCS service introduce needed competition in the wireless telephone service marketplace, but the licenses sold at auction generated nearly eight billion dollars in revenue for the United States Department of the Treasury. The success of the FCC's spectrum auctions has justifiably increased the Federal Government's interest in using an auction to assign other portions of the radio spectrum.

Because it was one of the first auctions conducted by the FCC, the broadband PCS auction was a "live" experiment that tested the effectiveness of the auction's numerous and, in

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[1] According to the FCC, PCS is "a family of mobile or portable radio communications services which could provide services to individuals and business, and be integrated with a variety of competing networks." Amendment of the Commission's Rules to Establish New Personal Communications Services, 7 FCC Rcd 5676, ¶29 (1992).

some cases, interrelated rules.[2] This paper examines "bidder neutrality," one criterion by which the auction's effectiveness can be measured. For purposes of this paper, an auction can be considered "bidder neutral" if its rules do not favor one class of bidder over another and, moreover, the auction's ability to extract economic rents from winning bidders is unrelated to the type of items they wish to acquire. This paper analyzes whether the FCC's auction rules involving the assignment of block A and B licenses satisfied this second condition.[3]

Our analysis indicates that, on average, the auctions involving licenses associated with lowly to moderately populated service areas closed later than licenses associated with highly populated service areas. As a result, winning bids on the former licenses tended to be higher than on the latter licenses. These higher prices appear to be caused by unnecessarily restrictive Stage III eligibility rules, which may have introduced an element of bidder non-neutrality into the broadband PCS auctions. This paper recommends that the Stage III rules be relaxed to permit bidders to switch more readily among licenses during the end of the auction. By reducing the degree to which budget constrained bidders must predict the final sales prices of licenses, this change may reduce the auction's bidder non-neutrality feature. This paper also examines the

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[2] This is not to imply that the rules of the auction were not carefully developed. Rather, it simply acknowledges that time constraints made it impossible to use economic experiments to analyze the final auction form and that existing auction theory fails to shed significant light on some of the complex technical issues raised by the PCS auction environment.

[3] The analysis contained in this paper was stimulated by an unpublished paper written by David J. Salant entitled: "Up in the Air: GTE's Experience in the MTA Auctions for PCS Licenses," July, 1995.

effects of bidders signaling that they are bidding on a limited number of areas.

Section III of this paper briefly describes the nature of the licenses up for auction and the expected broadband PCS bidding environment. Section IV presents the broadband PCS auction's major rules. Section V describes some of the strategic bidding aspects of the broadband PCS auction. Section VI presents an empirical test of the relationship between some expected forms of strategic bidding and the final sales prices of licenses. Finally, Section VII suggests modifications to the existing broadband PCS auction rules.

## III. Bidding Environment of the Broadband PCS Auctions

### A. Nature of Broadband PCS Licenses

The FCC allocated 120 MHz of spectrum for broadband PCS service, which it divided into three 30 MHz blocks (A, B, and C) and three 10 MHz blocks (D, E, and F). The service areas for blocks A and B corresponded to Rand McNally's Major Trading Areas ("MTAs"), while the service areas for blocks C, D, E, and F were coextensive with McNally's Basic Trading Areas ("BTA"). The United States and its territories, American Samoa, Guam, and the U.S. Virgin Islands, contain 51 MTAs and 493 BTAs, with the average MTA containing approximately 10 BTAs. A total of 2074 broadband PCS licenses will eventually be issued.